In football we find more injuries occur in a poorly conditioned, a fatigued or dazed man, or in a team that is demoralized and receiving a severe beating. These individuals are slowing up, not coördinating, and are apt to be injured.

If college athletics are to continue, especially football, those intrusted with the care of injured athletes must have the courage to keep any injured man from competition until he has completely recovered and is not suffering additional risk by virtue of his recent injury.

❋

GEORGE O. BERG, M. D. (6253 Hollywood Boulevard, Los Angeles).—In athletics we have preventive medicine as well as curative. We use all of the known principles in both fields, and we augment the first with suitable protections for all injuries.

We deal with men in a remarkable state of health. They recover rapidly, and most of them are fired with the ambition to compete. Many will hide injuries, and a small minority will magnify injuries. We are seeing a rapid evolution and change in the methods of diagnosis and care of injuries. The old-time "punch drunk" type of trainer is being replaced by men of training and sympathetic outlook.

In general, I agree with Doctor Thurber's comments on types and treatment of injury. Let me say that the common injury, known as charleyhorse, was studied scientifically by me at the University of Wisconsin ten years ago. By pathologic material from dogs I proved that the various stages such an injury goes through are:

1. Hemorrhage and serous swelling between muscle bundles, occurring chiefly close to the bone.
2. Subperiosteal hemorrhage.
3. Excavation of necrotic muscle tissue by polymorphonuclear leukocytes.
4. The formation of fibrin.
5. Change of this to the fibroblast.
6. Metamorphosis of the fibroblast to connective tissue cells.
7. The development of the connective tissue cell as a bridge.
8. The burrowing through an area of scar tissue by muscle-buds springing from uninjured muscle tissue with burrowing buds loaded with juvenile types of cellular nuclei in a manner similar to the function of the osteoblast.
9. Union of these buds and restoration of tissue, as well as function, provided we have not insulted nature by reinjury.

We use all standard methods of physiotherapy in treatment.

At this time I desire to warn this group against acceptance of unsupported statements by unscrupulous manufacturers that radiotherapy apparatus will not burn. Such a statement is untrue. We have had the misfortune of having a severe burn occur while treatment was being given under the direction of the demonstrator employed by one of these companies.

I have been successful in getting several cases of dislocated semilunar cartilages to heal with a reliable knee-joint resulting. This has been possible through immediate reduction of the dislocation under anesthesia and immediate application of a plaster cast and bed rest for two weeks following by appropriate physiotherapy.

❋

E. F. ROTH, M.D. (300 Homer Avenue, Palo Alto).—I find the set-up for the care of athletic injuries at the University of Southern California is much the same, with individual variations, as the set-up at Stanford University.

The public and the profession have been under the impression that athletic injuries as a whole have been handled in a haphazard manner, principally by trainers and rubbers. This article, therefore, gives some general idea of the facts in connection with athletic injuries as handled by most of the large universities on the Coast.

The treatments used coincide, as a rule, with those of any orthopedic surgeon, with the advantage of seeing the injuries immediately after their occurrence. Thus we are able to apply immediate control measures to hemorrhage and secondary trauma to the damaged tissues; and this, with the youth and enthusiasm of the patients, helps us to complete many rapid recoveries.

MORTALITY LESSONS IN A SERIES OF 4,029 GYNECOLOGIC OPERATIONS*†

By HAROLD K. MARSHALL, M.D.
AND
ROBERT H. THOMPSON, M.D.
Glendale

DISCUSSION *by L. A. Emge, M. D., San Francisco.*

THE value of mortality and morbidity studies is incontrovertible. The periodic audit establishes standards for comparison. Its advantages are many. For the patient, mortalities are reduced. For the surgeon, his illusions are disproved, his surgical conscience aroused and he is stimulated to greater efforts and to the correction of faults. Regular, honest auditing of our surgical results is a basic cornerstone upon which progress rests.

CLINICAL MATERIAL REVIEW: PERIOD FROM JULY 1, 1928 TO JULY 1, 1934, AT LOS ANGELES COUNTY HOSPITAL

In this paper is presented a review of the deaths on the gynecological service of the Los Angeles County Hospital, covering a period of six years, from July 1, 1928 to July 1, 1934. An analytical study of each case has been made with reference to preoperative status, type of operative procedure and postoperative course.

During the six-year period there were 7,812 patients admitted on the gynecological service, with a total of 183 deaths, an incidence of 2.3 per cent. A total of 3,783 patients were discharged without operation, leaving 4,029 (51.6 per cent) that underwent some type of primary operative procedure. There were 121 deaths in the operated group—a gross operative mortality of 3.0 per cent. Three thousand five hundred and five, or 87 per cent, of these were laparotomies; approximately 17 per cent of which were so-called "double cases," in which abdominal and vaginal plastic work were combined. A total of 524, or 13 per cent, were vaginal cases only. There were 2,352 hysterectomies done, including the three types, subtotal, total, and vaginal, which means that the uterus was removed in 58.4 per cent of all operations performed on the service. The vast majority of these were the subtotal type. There were 83 patients who died following hysterectomy, an incidence of 3.5 per cent.

Anesthesia records were not analyzed for the first three years of the period. During these years ether was used in the majority of cases, but the use of spinal anesthesia was steadily increasing. The last three years, spinal anesthesia was used in almost twice as many cases as was ether.

ARRANGEMENT OF THE SIX COUNTY HOSPITAL SERVICES IN GYNECOLOGY

There are six separate services in the gynecologic department, each with its senior and junior attending staff members. During the six-year period, fifteen attending staff members performed

* Read before the Obstetrics and Gynecology Section of the California Medical Association at the sixty-fourth annual session, Yosemite National Park, May 13-16, 1935.
† A statistical study of patients at the Los Angeles County Hospital (period 1928 to 1934).
From the Department of Obstetrics and Gynecology, University of Southern California School of Medicine.

TABLE 1.—*General Statistics—Six-Year Period*

Year	Total Admissions	Total Deaths	Total Operations	Operation Deaths	Hysterectomies	Hysterectomy Deaths	Laparotomies	Vaginal only
1928-29	856	18	516	15	214	11	438	78
1929-30	1,123	36	624	17	351	11	553	71
1930-31	1,325	38	710	25	399	22	617	93
1931-32	1,622	33	782	21	477	12	682	100
1932-33	1,303	30	675	26	450	17	602	73
1933-34	1,583	28	722	17	461	10	613	109
Totals	7,812	183	4,029	121	2,352	83	3,505	524
Per cent	100	2.3	51.6	3.0	58.4	3.5	87.0	13.0

2,954 operations, and ten resident staff members operated a total of 1,075 cases, so that twenty-five operators are represented here.

All patients at this hospital are supposed to be charity patients. The vast majority of them are in poor physical condition on admission. More often than not the gynecological condition bringing them to the hospital is in an advanced stage. Anemias and low general resistance are the rule. All these factors combine to make the patient a below par operative risk.

MORTALITY CLASSIFICATION

For the purpose of analysis, we have divided the mortalities for the period into:

1. *Malignancies*: Twenty-one cases, including four carcinoma of the cervix; five carcinoma of the fundus; one sarcoma of fundus; and eleven carcinoma of ovaries, many with metastases. All except one had laparotomies.

2. *Emergencies*: Seven cases, including four pelvic abscesses; two acute intestinal obstructions; and one ruptured gall-bladder cyst.

3. *Electives*: Ninety-three cases, including sixty-three subtotal, six total, and three vaginal hysterectomies; seventeen laparotomies other than hysterectomy; four vaginal plastic cases.

STUDY OF PREOPERATIVE STATUS CONFINED TO ELECTIVE GROUP

For obvious reasons, in our study of the preoperative status of the fatal cases we concerned ourselves only with the latter group, the so-called elective cases. In the malignancies and emergencies, we cannot always control the time or the type of operation, but in the elective group we are dealing with women who are having an operation on advice and not as an immediate necessity. The woman about to undergo an elective gynecologic operation has the right to be safeguarded in every way. As Norris [1] rightly points out, "no operation is so trivial that every step to safeguard the patient should not be employed, nor is any operation entirely free from the danger of a fatal termination. Major risks have to be taken, but every effort should be made to minimize them by preoperative study and care."

PREOPERATIVE DATA—ELECTIVE GROUP

Age.—Age did not appear to be much of a factor. The youngest was eighteen and the oldest seventy years. Sixty-two, or two-thirds of the cases, were between thirty and fifty years of age.

Weight.—There were eighty-one patients of average weight—100 to 150 pounds; five were under 100 pounds and seven over 175 pounds, five of these being over 200 pounds.

Preoperative Period in Hospital.—The average stay of patients in the hospital before operation was over a week. Only two were in the hospital under forty-eight hours prior to surgery. So I think we can say, with regard to preoperative stay in the hospital, that there was a very little so-called "railroading" of patients to surgery.

Blood Studies. — Five patients in the elective group had no blood count at all. An additional six had no hemoglobin nor red blood count determination, making a total of eleven cases operated without a hemoglobin or red blood count being made. Twenty-four patients were admitted with hemoglobin below 70 per cent; five below 30 per cent. In the series, twelve patients were given twenty blood transfusions before operation. Twelve patients went to surgery with hemoglobin below 70 per cent and eleven below 60 per cent, two of these below 40 per cent; and eleven additional cases underwent major elective surgery without any red blood count or hemoglobin studies. Obviously twenty-three patients, or 25 per cent, should not have been operated without further study. Ward [2] stresses the importance of the preoperative prophylactic transfusion, and emphasizes its value, not only in those patients with marked secondary anemia, but also in those borderline cases which show only a moderate loss—65 to 70 per cent hemoglobin and 3,000,000 to 3,500,000 red blood cells. He argues for the adoption of routine preoperative transfusions in patients with

TABLE 2.—*White Blood Count and Differential Before Operation*

7,000– 9,000	40	Polynuclears per cent:	
10,000–12,000	11	65 – 80 per cent	51
12,000–15,000	7	Below 65 per cent	14
15,000–19,000	6	Above 80 per cent	10
Above 20,000	2	Without Differential	18
Below 7,000	22		
Without W. B. C. or Differential	5		

57 per cent had abnormal W. B. C., or was not done.
45 per cent had abnormal Differential, or was not done.

hemoglobin under 70 per cent. An elective blood transfusion is a simple procedure and can be done at the operator's own time; and its advantages to the patient about to undergo surgery are too well known to need further elaboration.

These were the final counts before operation. In fairness it must be stated that some of these high counts were on admission, the patient being in the hospital from several days to a week, oftentimes with an improvement in symptoms and temperature; but the patient was operated without recheck of the white cells. There were twenty-two patients in the elective series with a white cell count below 7,000, a leukopenia suggestive of low resistance reserve. This latter point is borne out by the fact that of the six deaths occurring on the operating table, three had leukopenias. Five patients did not have a white blood count or a differential. Twenty-four, or 32 per cent, of the seventy-five differential counts made were abnormal and there were eighteen not determined, making 45 per cent on this basis and 57 per cent as judged by the white blood count, in which further study should have been done before proceeding with the operation.

Blood Wassermanns. — Sixteen of the elective cases had positive blood Wassermanns. Eight were not recorded. Thus 18.8 per cent of those recorded had positive Wassermann reactions. The general hospital incidence was checked for two years of the period studied, and found to be 4.53 per cent and 4.6 per cent. An incidence of positive blood Wassermanns in the fatal cases of four and one-half times that of the general hospital admission would seem to indicate that this may have been a factor, at least, in some of the cases.

Preoperative Temperature. — Low grade, preoperative temperature has more significance than we like to attribute to it. In our desire to get a patient's operation over with, often reinforced by the patient herself and the relatives, we are prone to disregard low temperature rises. We get away with it many times, but pay the penalty often enough to cause serious retrospection. Polak and Tollefson,[3] in their excellent paper on mortalities, state that a low-grade temperature of 99.2 plus means infection, and that operation in such cases should be postponed until the temperature is normal and has remained so for several days.

Sedimentation Test. — There were only seventeen blood sedimentation tests done on the entire series of 121 cases. Nine tests were under sixty minutes, the time commonly accepted as the lowest rate for safe surgery, and eight of these nine were under forty minutes. The sedimentation test was used in only twelve of fifty proved inflammatory cases in our series. In nine of the twelve in which it was used, its dictum was disregarded. It would seem that we are not taking advantage of this valuable aid to help us solve the perplexing problem of pelvic inflammatory disease.

TABLE 3.—*Temperature Twenty-four Hours Before Operation*

Normal temperature—99 or below	47
99.2–100	29
100 –101	10
101 –102	3
102 –103	3
104.8–	1

61 per cent had temperature 99 or above.
50 per cent had temperature 99.2 or above.

To operate and when, or not to operate at all in a pelvic inflammatory case, is the question daily before the gynecologist. It is now generally conceded that palliative and conservative methods give the best results. According to Aldridge,[4] approximately one-half (48 per cent) of hospital cases either heal completely or become symptom free, making operation unnecessary. Operation is recommended in the chronic stage only if conscientious palliative treatment over long periods has failed, and for disability of attacks which tend to recur in spite of treatment. Then surgery should not be resorted to until the leukocyte count, temperature, and sedimentation time are normal. Polak,[5] Aldridge,[6] Greenhill,[7] and Baer [8] are only a few who concur in this opinion. The Shilling differential blood cell count is often very helpful in doubtful cases.

It is the policy on the gynecologic service to follow the conservative method in the treatment of these inflammatory cases. Many patients are discharged without surgery. In the vast majority of cases surgery was only used after palliative methods failed or after disabling recurrent exacerbations. Practically all were given the benefit of varying periods of preoperative rest in bed. Despite this policy and surveillance, too many were operated before the process was sufficiently quiescent. Pathologic examination showed eight in the series in which the condition was either acute or subacute. A closer check on preoperative status and laboratory requisites would undoubtedly have been of benefit to many of these cases.

Blood Pressure.—Accepting 110 to 150 as the normal limits of systolic blood pressure, we found sixty-three patients in this range. Thirteen were below 110, and seventeen were found above 150. There were seven real hypertensions in the group, the systolic reading ranging from 175 to 220. A survey of the charts of these thirty patients, or 32 per cent, who were either above or below the standard range, shows that many would have been benefited by additional rest before surgery or that further laboratory tests or consultations would have been of benefit.

Urinalysis. — Four patients were adjudged to have more than one plus albumin. Both albumin and pus were found in seven patients; two had positive sugar; two acetone; and in one case casts were found. Two patients had P. S. P. readings below 50 per cent the first hour, one 25 per cent, and another 30 per cent. Eighteen patients, or 20 per cent, had chemical or microscopical pathology in the urine, which increased the operative risk and probably contributed some part in the fatal outcome. Review of one case tells the story. A hysterectomy and bilateral salpingo-oöphorectomy was performed for chronic inflammatory disease, despite two urine examinations showing four plus pus and a preoperative temperature of 101

TABLE 4.—*Final Diagnosis—Fatal Cases*

Electives	93	Malignancies	21
Inflammatory	29*	Cancer ovary and metastases	11
Fibroid	19	Cancer fundus	5
Fibroid and inflammatory	17	Cancer cervix	4
Fibrosis	5	Sarcoma fundus	1
Procidentia	5		
Hyperplasia	4	Emergencies	7
Retroversion	4	Pelvic abscess	4
Dermoid ovary	1	Intestinal obstruction	2
Polyp and hyperplasia	1	Rupture gall bladder cyst	1
Incomplete abortion	1		
Adhesions—postoperative	1	Total	121
Cystadenoma ovary	1		
Ectopic	1	Inflammatory Cases:	
Cysto—rectocele	2	Inflammatory 29	
Prolapse vaginal vault	1	Fibroid and inflammatory 17	
Erosion cervix	1	Pelvic abscess 4	
		Total 50—41%	

* T. B. salpingitis—four cases.

degrees. She died the seventh postoperative day of general sepsis, immediately after a profuse secondary hemorrhage from the wound. Autopsy showed a large dissecting wound abscess leading from the abdominal wall through the groin into the left psoas muscle, general streptococcic peritonitis, and severe bilateral streptococcic pyelitis. The urine, laden with pus, was significant and undoubtedly played the important rôle in the tragic end.

Table 4 lists the final diagnosis of the fatal cases. Only the major diagnosis is given. Note the high incidence of pelvic inflammatory disease: twenty-nine straight inflammatories, seventeen fibroids with inflammation, and four acute pelvic abscesses, making a total of fifty cases—an incidence of 41 per cent. Pelvic inflammation materially complicates surgical procedures and increases operative risk.

OPERATIVE PROCEDURES IN FATAL CASES

There were 114 laparotomies in the fatal group, among which are included three patients who had vaginal hysterectomies and in whom the peritoneal cavity was entered from below. Eighteen, or 16 per cent, of these were "double cases." Six cases had vaginal operations alone. The final case completing the group of 121 was not operated—death coming after spinal injection and before a proposed posterior colpotomy was started.

There were eighty-three hysterectomies done in the series, and of these seventy-one were the subtotal, nine the total, and three the vaginal type. A total of thirty-one laparotomies, other than hysterectomies were done, including nine for malignant conditions and five in emergency cases.

OPERATING TIME

In most series of fatal cases the operating times are prolonged, and this fact is usually stressed as an important factor in the unhappy outcome. An analysis of the operating times in this series seems to show them to be an exception to this rule.

Table 5 shows the time required for the various operations.

We think these figures bear out the fact that the time consumed at operation in this series was not prolonged. In fact, since many were in technically difficult and complicated cases, the operating times here indicate rapid surgery, and will compare favorably with any nonfatal group for similar operative procedures. Apparently, then, the operating time was not an important factor in most of these fatal issues. In some that were prolonged it was.

ANESTHESIA IN FATAL CASES

In the fatal cases the anesthetic used was about evenly divided between ether and spinal. A total of sixty cases, or approximately 50 per cent, were given ether alone, fifty-three cases, or 44 per cent, were given spinal—ten in the spinal group had to be supplemented, six with ether and four with nitrous oxid; five cases (4 per cent) had nitrous oxid only, and in the remaining three local novocain was used.

TABLE 5.—*Operating Times*

Operation	Number Cases	Minutes			Comment
		Shortest	Longest	Average	
Hysterectomy S. Total	71	25	148	61	2 under 30 minutes 12 under 40 minutes 42 under 60 minutes—60%
Hysterectomy Total	9	64	190	102	Average 41 minutes longer than S. T.
Hysterectomy Vaginal	3	69	109	89	
Other laparotomies	31	8	108	43	27 under 60 minutes—87%
"Double cases"	18	45	105	65	14 malignant and emergency cases
Vaginal plastics	4	23	103	62	7 under 60 minutes—40%
Colpotomies	2	15	15	15	

Average operating time all cases—59.7 minutes.
Average 114 laps. with 18 "double cases"—60 minutes.

TABLE 6.—*Complications During Operation—Fatal Cases*

Sigmoid perforated	7
Bladder perforated	4
Cecum perforated	2
Rectum perforated	2
Ureter cut	2
Ileum perforated	1
Hemorrhage with clamps left in	1
Patient's hands in operating wound	1
	20

OPERATIVE COMPLICATIONS

The serious complications which occurred during operation are listed in Table 6, and the serious postoperative complications in Table 7.

Seven of the complications listed occurred in the malignancy, and four in the emergency group where there is often ample reason for such catastrophies. It was surprising to see how often the bowel or the bladder was injured and went unrecognized at the time of surgery—the complication becoming apparent only with the development of fistulae or discovered at autopsy, most of them occurring in complicated cases made difficult by inflammatory or postoperative adhesions. In forty-six, or 50 per cent, of the elective group, adhesions were listed as a factor.

Table 8 shows the interval between operation and death. Six patients died on the operating table. An additional nine lived less than twenty-four hours. The largest number of deaths occurred on the fourth and fifth days, when peritonitis takes its greatest toll. A total of eighty-five, or 70 per cent, died within the first ten days after surgery. The remaining thirty-six died at varying intervals, the longest 105 days after operation.

PRIMARY CAUSES OF DEATH

In determining the primary cause of death, the autopsy report, attending surgeon's note when present, resident's, internes' and nurses' notes, were all considered, and usually made the cause clear. Fortunately, 55 of the 121 fatal cases came to autopsy, with an additional case of postoperative intestinal obstruction reoperated, and diagnosis confirmed seven hours before death—really an antemortem autopsy. Thus, in 46.3 per cent of all operative deaths, and in forty-six, or approximately 50 per cent, of the ninety-three elective cases, postmortem examination gave the actual cause of death. We feel this is an excellent autopsy record and worthy of commendation. It is a much higher autopsy percentage than usually reported in similar mortality series. We think this greatly increases the value of any study of mortalities. It was interesting to note how frequently a clinical diagnosis of shock, cerebral accident or cardiac failure was replaced by peritonitis or hemorrhage when the case was subjected to autopsy examination.

TABLE 7.—*Serious Postoperative Complications—Fatal Cases*

Intra-abdominal hemorrhage	16	(Autopsy 11, clinical 5)
Fecal fistula	8	
Eviseration	3	
Massive wound hemorrhage	3	
Vesico-vaginal fistula	3	
Vesico-abdominal fistula	2	
Extensive cellulitis	3	
	38	

Peritonitis was responsible for the death of forty-eight, or 40 per cent, of all cases in the series. Add to these the three cases listed as general sepsis and we have a total of fifty-one, or 42.5 per cent, dying of peritonitis and infection. Several of the deaths from peritonitis were directly attributable to injuries to the bowel, bladder or ureters during operation. The greatest incidence was in patients with inflammatory disease. A total of nineteen patients (20 per cent) in the elective group were presumably infected and were drained, three through the vagina. There were thirty-two (34.5 per cent) associated appendectomies in the elective group. We were unable to draw any definite conclusions regarding the effect of this additional procedure in the fatal outcome.

TABLE 8.—*Interval Between Operation and Death*

Death on table	6	11-15 days	10
Less than 24 hours	9	16-20 days	7
1 day	6	21-30 days	9
2 days	7	31-40 days	4
3 days	8	41-50 days	3
4 days	11	51-60 days	2
5 days	15	105 days	1
6 days	8		
7 days	3	Total	36
8 days	1		
9 days	7		
10 days	4		
Total	85		

In no less than four cases the appendix was described by the operator as being "bound down by dense adhesions," and technical difficulty was experienced in removal. In only one case was the appendix directly blamed for a fatal peritonitis. This case at autopsy exhibited an abscess around the appendix stump.

Next to peritonitis is hemorrhage; primary hemorrhage accounting for twelve, and secondary hemorrhage for three, for a total of fifteen deaths, or 12.4 per cent. A total of ten of the fifteen, or two-thirds, of the cases were verified by autopsy. Shock was next, with eleven fatalities (seven clinical and four autopsy diagnoses). It is probable that some of those clinically diagnosed as shock were hemorrhage. Shock and hemorrhage are usually considered together in such a study because, without autopsy, it is difficult to differentiate. Our high postmortem record in the bleeding cases made such a division possible. If we list these two together, we have hemorrhage and shock accounting for twenty-six, or 21.4 per cent, of the total deaths. Add to these twenty-six, another four cases in which hemorrhage was listed as an important contributing cause of death, and we are surprised by the size of the figures. Eight of the fifteen hemorrhage cases (53 per cent) occurred in the inflammatory group where raw surfaces and oozing areas made hemostasis

TABLE 9.—*Primary Causes of Deaths—All Cases*

	Clinical	Autopsy	Total	Percentage
Peritonitis	26	22	48	40.0
Hemorrhage—primary	4	8	12	12.4
Hemorrhage—secondary	1	2	3	
Shock	7	4	11	9.0
Embolism	5	6	11	9.0
Myocardial insufficiency	7	1	8	6.5
Pneumonia	2	4	6	5.0
Malignant cachexia	6	0	6	5.0
Ileus	1	2	3	2.5
Intestinal obstruction	1*	2	3	2.5
Sepsis	2	1	3	2.5
Anesthesia	0	2	2	1.6
Cardiarenal	1	0	1	.8
Cerebral accident	1	0	1	.8
Acute dilated stomach	0	1	1	.8
Diabetic coma	1	0	1	.8
Uremia	1	0	1	.8
Totals	66	55	121	100

* Confirmed by reoperation seven hours before death.
Autopsies—All cases 46.3%
Autopsies—Elective cases 49.5%

difficult. There were four fatal hemorrhages, however, which occurred in relatively easy cases. All four were subtotal hysterectomies in which the operator, in describing the operation, used terms such as "simple procedure," "minimal shock," "without difficulty." These hysterectomies were completed in an average time of twenty-nine minutes. A few additional minutes for checking or re-ligating vital areas might have changed the outcome.

Embolism shared honors with shock with eleven, or 9 per cent. The following facts stand out in this group: six of the eleven (54 per cent) were afebrile before surgery, which is about the same ratio as all cases. In this group, seven of the eleven (64 per cent) had vaginal plastic work done, either alone or associated with laparotomy; while only twenty-five of the 120 operated cases (20 per cent) had vaginal plastic work. Thus, seven of the embolic deaths occurred in the twenty-five vaginal cases, an incidence of 28 per cent, while the remaining ninety-five cases, in which no vaginal plastic work was done, accounted for only four embolic deaths, an incidence of 4.2 per cent. Of the eleven, four, or 36 per cent, had uterine fibroids, whereas fibroids made up 30 per cent of the entire group. In only two of the seven autopsied were thrombi or pathology demonstrated in the pelvic veins.

Myocardial insufficiency followed with eight, and cardiorenal disease with one, making a total of nine, or 7.4 per cent, in which cardiac failure was the primary factor. Four of the eight were obese; only three gave any indication in their histories of possible cardiac pathology. There was no record of previous decompensation in the entire group. In the preoperative examination definite cardiac pathology was found in three, and in two others it was questionable. In this group, six of the eight had fibroids of the uterus and one of the two remaining had a fibroid polyp. The association of myocardial disease and fibroids has before been noted repeatedly. Excessive surgery for a minor complaint was the outstanding factor in the cardiorenal death.

Pneumonia and malignancy and cachexia have six each, or 5 per cent. Of the six patients who died of pneumonia, four were aged—over sixty years. Only one showed pulmonary pathology at preoperative examination. Respiratory anesthesia did not prove to be the chief offender. On the contrary, three of the six cases had only spinal; one had spinal, supplemented with nitrous oxid and ether; one had only ether and one had local novocain.

The six deaths that occurred on the operating table are of sufficient interest to analyze briefly. Pelvic inflammation was present in five of the six; two were obese, 220 and 250 pounds; two had cardiac disease; three had leukopenias, and one no blood count at all. Ether was the anesthetic in four, nitrous oxid and ether in one, and spinal in one. All cases were autopsied and causes of death were as follows: Operative shock, two; cardiac failure, two; anesthesia, two. One of the two anesthetic deaths had ether for eighty-five minutes, the operation requiring seventy minutes. Autopsy report was "etherization with somewhat persistent thymus weighing 33 grams." The spinal death was the only case in the entire series not operated. A posterior colpotomy was proposed, but the patient died five minutes after 100 milligrams of novocain had been injected. The obesity

TABLE 10.—*Operative Complications—Total Hysterectomy Group*

Benign cases:	
Oozing cul-de-sac—packed to control	2
Bladder opened	1
Both ureters cut	1
Malignant cases:	
Ureter cut—vesicovaginal fistula	1
Cecum and sigmoid opened—vesico-vaginal fistula	1
Vesicovaginal fistula	1

Average time 41 minutes (67%) longer than subtotal.
Operative complications frequent.
75% died of peritonitis.

(220 pounds), low blood pressure (80/60), the Trendelenburg position, and the general toxemia from peritonitis secondary to a pelvic abscess, were the factors which made the patient a poor spinal risk.

COMMENT

An analytical review such as this must necessarily be incomplete. It is always of more interest and benefit to the reviewer than to the reader. A survey of the entire study brings up many interesting sidelights and points for discussion. The following seem timely and to be of some value:

Total Versus Subtotal Hysterectomy. — In recent years there has been considerable interest in the advantages of total versus subtotal hysterectomy. In our series of fatal cases there were too few total hysterectomies to justify definite conclusions. However, certain facts are interesting and somewhat indicative. Six were done for benign conditions, and three for malignancies. The operating time averaged 102 minutes, 41 minutes longer than the average for the subtotal operation. In only two cases out of nine were no special complications mentioned in the dictated operative record.

In our series the total hysterectomy operation required 67 per cent longer time to perform; was replete with serious operative and postoperative complications, and 75 per cent of the cases died of peritonitis.

Diagnostic Dilatation and Curettage.—The diagnostic dilatation and curettage seems to have lost its popularity. This valuable diagnostic procedure was not employed once in the entire series of 121 fatal cases. One dilatation of the cervix was done and a pyometria discovered which prevented a contemplated Watkins interposition operation. A diagnostic dilatation and curettage, and pelvic examination under anesthesia, often help materially to clear up a diagnosis, and shorter and simpler operative procedures can be done, amply caring for the pathology. A review of the cases shows it would have been of decided value in at least eleven cases, and undoubtedly would have changed the operative procedure in an additional five cases of malignancy. The question is raised, should not all puzzling menorrhagias and metrorrhagias have a diagnostic curettement?

Radiotherapy.—While on the subject of more conservative procedures being curative, the question of radiotherapy comes up. In some of the patients in this series its use might have been seriously considered. A careful study of the cases, constantly keeping in mind the conditions, indications, and especially the contraindications for its use, shows that radium might have been used to advantage in some twenty patients in the group. It would have been satisfactory in three of the eight fatal myocardial cases.

Radiotherapy has a definite place in gynecology. It must be used with judgment and with proper regard for its indications and contraindications. It is not a "cure-all," and has definite, sharply defined limitations. Keeping this in mind, it is often the most conservative curative measure—many times life-saving—where other operative procedures would and do prove fatal.

SUMMARY OF STATISTICS

In a series of 4,029 gynecologic operations at the Los Angeles County Hospital there were 121 deaths—a gross operative mortality of 3 per cent. Two thousand three hundred and fifty-two were hysterectomies, with a mortality of 3.5 per cent. Eighty-seven per cent of the entire group were laparotomies and 13 per cent vaginal cases only.

In the 121 cases, twenty-one were malignancies, seven were emergencies, and ninety-three were so-called elective cases. In the elective group the more frequent diagnoses encountered were: pelvic inflammatory, twenty-nine; fibroids and inflammatory, seventeen; and fibroids, nineteen.

The most frequent causes of death were as follows: peritonitis and sepsis, 42.5 per cent; hemorrhage and shock, 21.4 per cent; embolism, 9 per cent; cardiac failure, 7.4 per cent; pneumonia, 5 per cent; and malignancy and cachexia, 5 per cent. Autopsies were performed in 46.3 per cent of all cases in the series, and in approximately one-half of the elective group.

There were twenty serious complications during operation, and thirty-eight serious postoperative complications.

CONCLUSIONS

Preoperative study and care are of the greatest importance. Despite the average stay of one week in the hospital prior to operation, inadequate studies were made in too many of the cases. Additional laboratory work and more consultations would have benefited many patients.

Too often, the physical and laboratory findings and important preoperative requisites that make for good operative risks were disregarded.

More preoperative blood transfusions in the anemic and border-line cases are indicated.

Despite knowledge and efforts to the contrary, patients with pelvic inflammatory disease are being operated too early and too often. The sedimentation test is not being used sufficiently in these cases.

A closer check of the patient's complaints with the operative procedure would prove of value. The diagnostic dilatation and curettage should be used more frequently.

In certain poor-risk cases where indications are met, radiotherapy should be considered.

Considering the type of patients and the operative risks, the operative mortality here reported compares favorably with that reported by similar clinics.

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DISCUSSION

L. M. Emge, M. D. (2000 Van Ness Avenue, San Francisco). — The excellent analysis presented by Doctors Marshall and Thompson constitutes a very courageous document. I have a great deal of respect for the chief of a large service who has the courage to permit the publication and discussion of such a document. At best, any analysis of this sort will invite some just, and some unjust, criticism. For instance, why should patients be operated on during the acute stage of pelvic inflammatory disease, unless it be for the simple drainage of a pelvic abscess? The essayists point out that all surgical patients are housed for at least one week prior to operation. This certainly is enough time to segregate the poor from the good surgical risks, so that there remains no excuse for undertaking major surgery on patients who are still in the stage of acute infection, or who otherwise constitute a questionable surgical risk. There certainly exists no emergency in most of these patients; therefore, why not reduce the surgical risk by conservative medical measures? Most operations can wait. I appreciate that in a large service the head of the department cannot be in such intimate contact with details that he can pass on every case. This is a matter for the division chiefs to decide. In an analysis such as presented here, the work of the individual division should be compared, so that one might learn what operators have the lowest mortality. I am sure this would be very salutary and invite competition for lower mortality records.

I do not like to appear to be critical, and I do hope that my remarks will be considered in the spirit of friendly analysis. May I, therefore, be pardoned for saying that the high mortality in cases of malignancy indicates a rather reactionary method of surgical therapeusis; for, certainly, surgery of the malignant cervix must be seriously questioned except in the very early localized tumors, and even these are perhaps more successfully treated by irradiation, as far as mortality is concerned.

TABLE 1.—*On Operations at Lane and San Francisco Hospitals*

OPERATIONS—1924-1934			
Lane Gynecological Service:		Deaths	Per Cent
Major	995	22	2.2
Minor	703	2	0.28
Total	1,698	24	1.4
San Francisco Hospital and Stanford Gynecological Service:		Deaths	Per Cent
Major	1,379	46	3.3
Minor	1,844	3	0.1
Total	3,223	49	1.5

TABLE 2.—*On Hysterectomies at Lane and San Francisco Hospitals*

HYSTERECTOMIES—1924-1934			
Lane Hospital:		Deaths	Per Cent
Abdominal, Complete	307	10	3.2
Abdominal, supravaginal	265	8	3.0
Vaginal	73	0	
Total	645	18	2.8
San Francisco Hospital:		Deaths	Per Cent
Abdominal, complete	196	8	4.0
Abdominal, supravaginal	408	12	2.9
Vaginal	28	4	14.3
Total	632	24	3.9

May I also say that the time element in operations is not anywhere nearly as important as we are made to believe; for good anesthesia, gentle handling of tissues, the selection of patients, the preoperative care, and transfusions permit a more deliberate surgical approach, with a resultant reduction in postoperative complications. Fifteen per cent of all deaths because of secondary hemorrhage after hysterectomy is a rather serious indictment against spectacular speed in surgery, unless it can be blamed upon lack of skill.

The surgical service of the department of obstetrics and gynecology at Stanford is not as large as the one represented here by Doctors Marshall and Thompson. In our combined clinic services at Lane and San Francisco hospitals, over a period of ten years, there were 4,921 operations, with slightly less than 1.5 per cent mortality. If you will compare the figures between the two services, you will also see that there is also a slight difference in mortality rates, in which that of the service at San Francisco Hospital corresponds closely to the figures shown here.

Nevertheless, the total figure for all operations is considerably lower because of the dilution by minor operations. If you take the hysterectomies, on the other hand, and compare the end-results of our services with that of the Los Angeles General Hospital, you will find that the total figure is approximately the same, although there is again a marked difference between the figures of the Lane Hospital Service, as compared with the San Francisco Hospital service. I particularly point to the difference in vaginal hysterectomies, in which there were no deaths on the Lane service. Our figures bring out one factor: that the mortality rate for complete and supravaginal hysterectomies may be kept at an equal level, as shown in the figures of the Lane service. It is also interesting to note that hysterectomies made up about 46 per cent of the major operations at our San Francisco Hospital service, and 65 per cent at the Lane service.

Peritonitis was the commonest cause of death on both services, constituting about one-fourth of our mortality. We had no deaths from secondary hemorrhage. Cardiac failure and intestinal complications made up the bulk of the remainder of the causes. Embolus and shock were rare. Carcinomatosis, discovered at exploratory laparotomies, is included in this group as a cause of death.

The number of operators for the two services varies between nine and ten. . . .

May I say, in conclusion, that the figures I have shown here are not presented in a spirit of righteousness, but only as a matter of comparison. I consider it a great privilege to have been asked to discuss this paper, and I wish to extend congratulations and thanks of this section to the essayists for having undertaken this extensive piece of work.